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File Code: 2500 Date: 8/11/17
Subject: Tamarack Allotment Report:

To: Tim Collins, IDT Leader

Tim,

Please accept this report for the Tamarack allotment documentation.

Background Information

The Tamarack Cattle Allotment is located in the southern portion of the Heppner Ranger District at T 7 S, R25 E; T 7 S, R 26 E; T 8 S, R 25 E; and T 8 S, R 26 E in portions of the Wall Creek and Lower John Day River/Kahler Creek watersheds. It encompasses approximately 19,441 acres of which 19,391 acres are on National Forest System Lands and 50 acres are on private lands. The main drainages within this allotment are: Big Wall, South Fork of Big Wall, Dark Canyon, Lost Canyon, Haystack, West Bologna, Tamarack, and Burnt Cabin. Elevation ranges from 2500 near Wall Creek to 4975 at Tamarack Mountain. The existing Allotment Management Plan was completed in 1979.

Purpose & Need

The forest plan recognizes the continuing need for forage production and has determined that the Tamarack Allotment is capable and suitable to support grazing by domestic livestock. There is a continuing existing need on the part of the permittee to continue grazing on this allotment.

I have reviewed the project proposal and resource data for this project.

Terrerstrial Ecosystem Unit Inventory information for the Tamarack Allotment

Allotment Area and Soil Order (Soil Development)

The TEUI (Terrestrail Ecosystem Unit Inventory) has been mapped within the allotment. The mapping is broken into Map Units (MU). Each of these MUs may contain up to four individual soils series. When we examine the taxonomic development of these soils we find the allotment mostly developed under grassland site conditions. Mollisol soils are classified by a high base cation content (plant available soil nutrient levels), not typically found in forested environments.

There is also some Andisol mapped in the area. Andisols are developed from volcanic deposition in this area of the Umatilla NF, this deposition is from airfall. Andisols are commonly considered to have a high plant availability of soil mositure.

Allotment Area and Soil Productivity

Both the Andic soils and Mollisols can have elevated productivity, but for differing reasons. Andisols are noted for having elevated mositure retnetion, mostly due to a loamy soil structure of the mineral conponents (ash). This soil structure helps infiltration of mositure and the vesicled nature of volcanic glass increases the plant available mositure retained with capilary action. It is this soil/water retention in Andisols providing mositure to allow root presure (Stocking 1956), to overcome capliary action of the soil. In Mollisols root presure may not have the ability to overcome capliary action in clay soils, So later int eh season they can be droughty to some plants.

The same capilary action of soils and root presure of plants occur within Mollisols, but many Mollisols hold mositure within root restricting clays or the narrow space between clay particles. Water within these narrow spaces is prevented from being released by the clay dominated capilary fringe. Therefore Mollisols may have greater volumes of nutrients than the andisols, in some cases more mositure. But without the catalyst of nutrient transfer (available moisture); these nutrients effectively remain out of reach to plants.

Impacts from Grazing Activity

Of the impacts that may occur from grazing, compaction and loss of surface organic matter can lead to productivity losses. Soil compaction of the soil in areas where animals (managed and unmanaged) congregate, is possible and could lead to a decline in soil productivity. Soil comapaction alters nutrient avaialbility due to changes in SOM mineralization, residue decomposition and nutrient movement in the soil, partentially contributing to pasture erosion degredation (Dubeux, et al 2007).This compaction could also add to a loss of soil productivity from localized surface erosion. Therefore timing of grazing and ensuring enough palitable vegetation may help to limit congregation of managed animals in areas which can promote compaction and erosion (Swanson et al 2015), like soil compaction within riparian areas. Timing must also be a consideration when considering an issue like soil health.

Improvements to soil physical properties (soil strucutre and decreased compaction) in grazing allotments can be achived in some cases with exclusion of grazing activities to an area. Exclusion benefits soil characteristics from vegetation and litter additions (Miller et al 2010), and is supporting evidence for maintaining the allotments current exclusion.

Potential erosion risk

Of the things that can influence erosion in most range settings; is loss of effective ground cover (EGC), soil compaction from animal traffic or riparian (stream) degredation. To estimate a risk of erosion from animal induced compaction Figure 1 was developed to show areas of elevated risk of erosion.

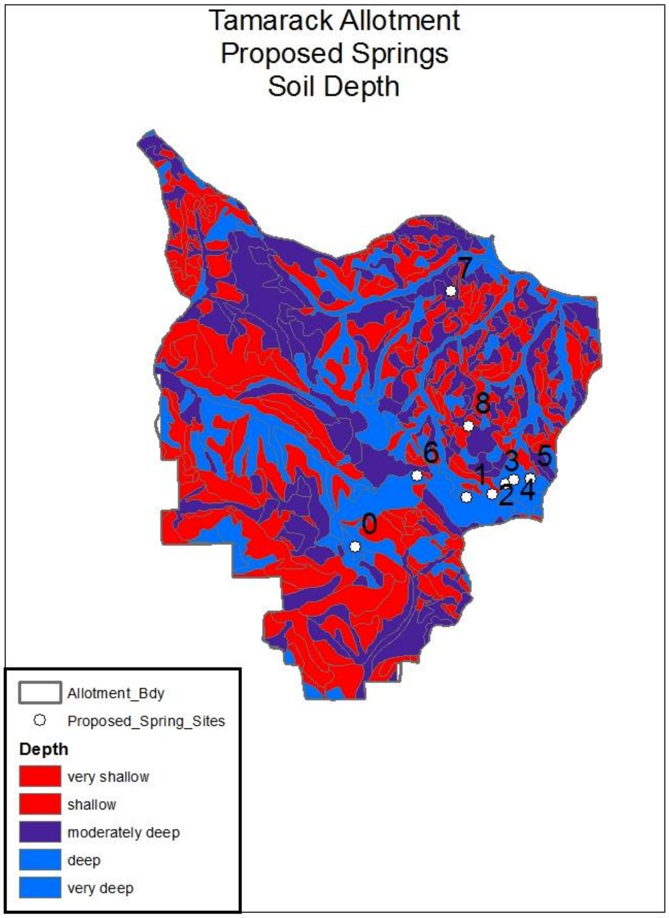


Figure 1. Proposed springs and mapped soil depths within the Tamarack allotment

When reduced infiltration occurs, the nutrient laden portion of the soil can be at risk; displaced by the collection of surface water forming sheet erosion. It would occure near water sources and along fencelines where animal congregation occurs.

Where soil depth is shallow and EGC does not minimize rain splash displacement and entrainment of the soil (erosion), the risk of erosion should be considerd high. Reason being is a shallow soil with chronic losses from erosion will reduce site productivity and enter into a trend of productivity losses until the area is put into rest. Depending upon the level of loss, the rest period may be many years.

Proposed Spring Development relationship to Soil Temperature and Moisture Regiemes

Within the GIS provided data for this project, nine proposed spring sites are identified. Of the spring sites four are listed as needing development. The other five sites are listed as seeps. Figure 2 shows the location of these proposed spring developments and their location in relationship to soil orders mapped in the area.

In the Figure 2 we see the five locations listed as seeps correspond with the andic soil properties. This corresponding information is supported by the idea that Andisols have a higher retention of water near the interface between andic and mineral soil properties. Additionally within Figure 2 the sites needing additional development are associated with the Mollic soils.

Other information related to the TEUI soil mapping is soil temperture and moisture ranges (Figure 3). When we examine this information in relationship to the location of proposed springs; we see again the five seeps in Andic soils are located with a frigid soil temperture and a udic (sufficient moisture) condition. A sign these spring proposals are well positioned on the landscape. Soil classified as udic are defined as including a condition which allows for sufficently high year round moisture (in most years) to meet plant needs (Brady & Weil, 1999). Given the seep condition (surface water) at the sites maybe an indication of a minor mapping unit with perudic (excess mositure) conditions were not recognized in the TEUI; likely due to the small area in this condition. Field evaluation of perudic conditions was not made.

Summary of Environmental Consequences

In all three alternatives, under which there would be no grazing (Alternative 1) or grazing from May 1 to September 15, all of the soils mapped within the allotment potentially have enough nutrient value for vegetation growth in pastures, primarily because the soil on most of the acres are Mollisols, meaning they have developed over time under grassland conditions and tend to be fertile soils. Soils in some of the mapped areas are Andisols. These are soils formed from volcanic material and they may also have elevated soil/moisture with the potential to make nutrients available to desirable forage. This is especially true where the ash layers from Andisol development overlay nutrient accumulations of Mollisol soils.

The proposed spring developments as described in Alternative 3, are a mixed result from a soils perspective. Five of the nine proposed spring sites are likely to be attainable (Springs 1, 2, 3, 4 and 5),

given that they have adequate soil depth, ash soils, and noted seeps. The remaining proposed spring sites may be more problematic. These sites do not have mention of water in the Terrestrial Ecological Unit Inventory (TEUI) 3 survey data. In fact, these locations in the TEUI data are noted as having xeric conditions (having long periods of drought in the summer). Lastly, it is possible the shallow soil of Spring Development 8 could be developed for use by animals, but the shallow soils of the site will have little resilience for grazing damage.

Unless there is water present; any development (at sites 0, 6, 7, or 8) may have to rely on precipitation or water piped in from another source. This evaluation considers these developments as low-volume water sources with seasonal viability.

Provided the stipulated soil project design criteria (see Appendix A) are fully implemented the impact of all alternatives would likely create minimal or unmeasurable impacts to the soil resource. There is a low likelihood of beneficial effect to the soil. It is possible that the grazing would spur growth of grasses and herbs and that subsequent root development would add more soil organic matter to the resource; however, given the proposed utilization standards and the timing of grazing, any benefit from such an effect may not be measurable.

Because Alternatives 1, 2, and 3 would have little or no impact on soils, there would be no cumulative impact caused by the incremental addition of the effects of any of the alternatives to the effects of other past, present, or reasonably foreseeable activities in the project area.

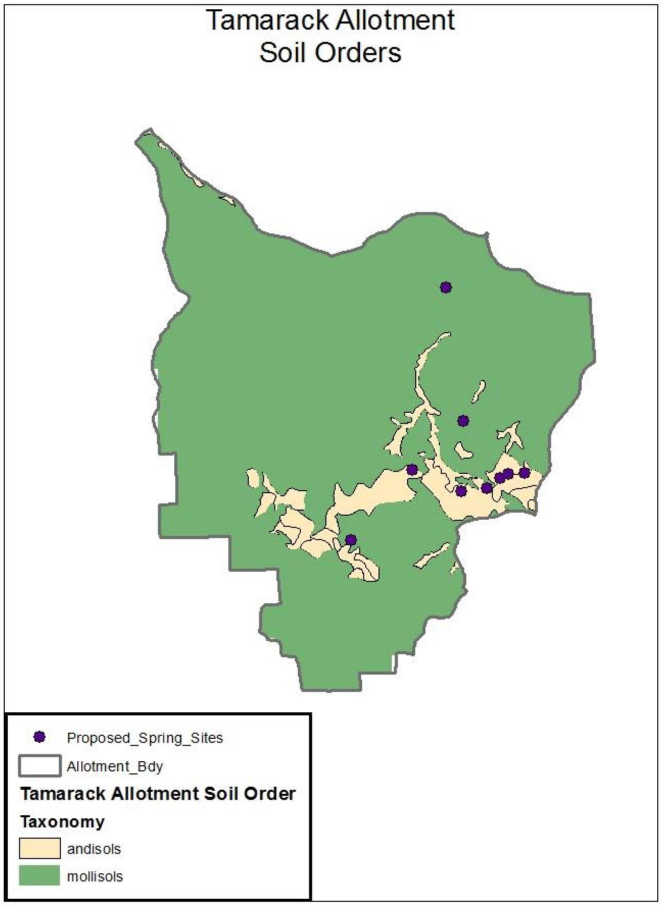


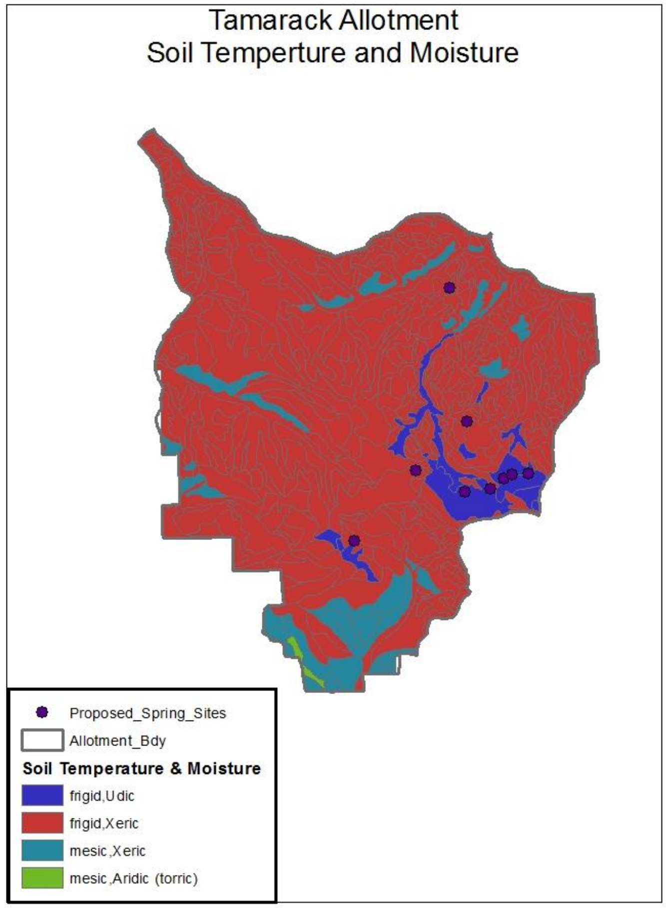
Figure 2 Soil Orders mapped with proposed spring locations in the Tamarack Allotment

Development of the springs noted as seeps will likely be achived with ease.

In Figure 3 the remaining spring proposals (needing development), also reside within frigid tempertures, but xeric (dry) soil mositure conditions. Xeric soil conditions are recognized for having long periods of drought in the summer (Brady & Weil, 1999). When we take a closer look at the soil MUs associated with the proposed spring develoment in Figure 4 and Table 1. Data for this soil analysis is listed appendix A of this report in Table 1. These springs are noted in GIS and Table 1 with the unique identifier FID identifier of 0, 6, 7, and 8.

An examination of soil relationship to spring 0 and to its mapped soil series (TEUI), shows it listed as Melhorn-Larabee-Klickson MU complex. Within Table 1, the moisture regime (xeric or dry) and soil depth (deepto v.deep) have been listed. While there is no indication of elevated soil mositure in the TEUI data or the proposal for proposed springs 0, 6, 7 and 8, it may be possible a structure will be able to retain mositrue or precipitation accumulations.

The depth of the soil in some cases proposed spring 0-7; offers potential for



possible collection of water.

Figure 3 Soil Temperature and Moisture Regimes

Proposed Spring Devlopment 6 is associated with the MU defined by Tolo-Larabee-Fivebearver MU. Like proposed Spring Development 0, two of the three soil series associated with Spring Devlopment 6 are classified as being moderately deep to V.deep. However, the last soil series in the complex (Fivebeaver) is a shallow to bedrock soil. With the implication of a shallow soil in the area of a proposed spring development, it may be nessesary do further site evaluation of soil depth needs with Spring 6. Like proposed Spring Development 6; Proposed Spring Development 7 has a mixed soil depth in the MU soils, two moderatly deep and a shallow soil (Bolony-Anatone-Klicker). The difference between these mapunits is the promenece of the shallow soil (Anatone), with Spring Development 7 the second most prominent soil is mapped as shallow. This means there may be a higher incidence of shallow soil; reducing the likelyhood of a successful spring development long-term.

Existing Water Developments

Also there are other water developments within the allotment, 68 in total mapped in GIS. When we examine the proximity of established water developments to proposed sites we see two propsoed spring developments (FID

2 and FID 6) are within 200 feet of existing water developments (Dam 314 and Dam 315 respectively). Expanding that proximity to 1,000 feet of proposed Spring Developments we see there are additional sites added, but only one additional proposed spring development. Using this examination we see a Pit Tank (#330) is within 1,000 feet of proposed spring development 6. In disscussions with the projects team leader, proposed water developments are prefered over existing dams and would cause less resource damage than existing water features.

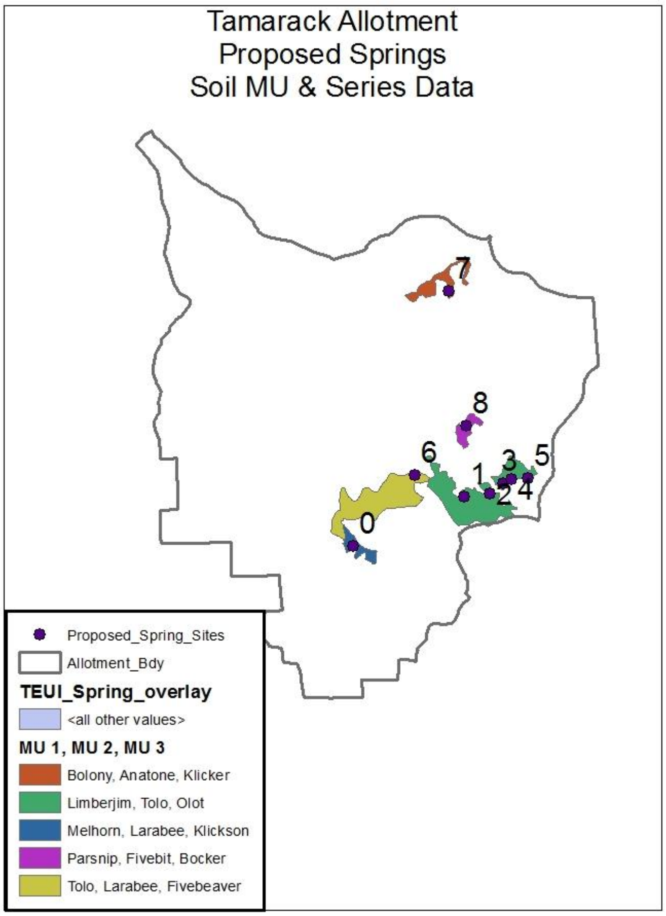


Figure 4 Soil MU from the TEUI and its associated Soil Series data.

The last proposed Spring Development 8 is associated with Parsnip-Fivebit-Bocker MU. Purely from a soils resource perspective, proposed spring 8, has the least likelyhood of effectively accumulating and holding water on the landscape;. Additionally, if a spring is developed at site 8; the shallow soils may also lead to other indirect issues of compaction and erosion of this shallow soil. The shallow nature of these soils with their plastic (clayey) subsoil could be damaged. If such a site is compacted; rehabilitation of this compaction will be costly or unattainable. In many cases compacted shallow soils are costly to rehabilitate, due to the physical limits of the shallow soil. With the listed design criteria, the other sites 0-7 should have adaquate resilience to compaction and erosion. If rehabilitation is needed they have adaqaute soil depth to allow for such activities.

Findings

With proposed timing of grazing, all of the soils mapped within the allotment potentially have enough nutrient value to produce needed vegetation in pastures; especially since most of the acres developed under grassland conditions (Mollisols) over time. Some areas also may have elevated soil/mositure potentail (Andisols) to make those nutruients avaialble to desired forage.

The proposed spring developments are a mixed results from a soils perspecive. Five of the nine proposed spring sites are likely to be attainable (Springs 1, 2, 3, 4 and 5), given their assocaition with adaqaute soil depth, ash soils and noted seeps. The remaining proposed springs sites may be more problematic. As mentioned earlier these sites do not have mention of water in the EAs documentation or in the TEUI survey data. In fact these locations in the TEUI data are noted as xeric conditions (long periods of drought in the summer). Lastly since it is possible the shallow soil of Spring Development 8 could be developed and utilized by animals, but the shallow soils of the site will have the least resilience for grazing damage. If one of the spring development sites is to be dropped for resource concerns, spring development site 8 would be a good candidate for removal from the EA.

Unless there is an existing presence of water; any development constructed (at sites 0, 6, 7, or 8) may have to rely on precipitation accumulations or water piped from another source. This evaluation will consider these developments as low volume water sources with seasonal viability.

Provided the stipulated soil mitigations (attacehed Design Criteria) within this report are fully implemented the environamental impacts of this project will likely create minimal or unmeasureable to the soil reousrce.

Summary of Environmental Consequences

In all three alternatives, under which there would be no grazing (Alternative 1) or grazing from May 1 to September 15, all of the soils mapped within the allotment potentially have enough nutrient value for vegetation growth in pastures, primarily because the soil on most of the acres are Mollisols, meaning they have developed over time under grassland conditions and tend to be fertile soils. Soils in some of the mapped areas are Andisols. These are soils formed from volcanic material and they may also have elevated soil/moisture with the potential to make nutrients available to desirable forage. This is especially true where the ash layers from Andisol development overlay nutrient accumulations of Mollisol soils.

The proposed spring developments as described in Alternative 3, are a mixed result from a soils perspective. Five of the nine proposed spring sites are likely to be attainable (Springs 1, 2, 3, 4 and 5), given that they have adequate soil depth, ash soils, and noted seeps. The remaining proposed spring sites may be more problematic. These sites do not have mention of water in the Terrestrial Ecological Unit Inventory (TEUI)3 survey data. In fact, these locations in the TEUI data are noted as having xeric conditions (having long periods of drought in the summer). Lastly, it is possible the shallow soil of Spring Development 8 could be developed for use by animals, but the shallow soils of the site will have little resilience for grazing damage. Unless there is water present; any development (at sites 0, 6, 7, or 8) may have to rely on precipitation or water piped in from another source. This evaluation considers these developments as low-volume water sources with seasonal viability.

Provided the stipulated soil project design criteria (see Appendix A) are fully implemented the impact of all alternatives would likely create minimal or unmeasurable impacts to the soil resource. There is a low likelihood of beneficial effect to the soil. It is possible that the grazing would spur growth of grasses and herbs and that subsequent root development would add more soil organic matter to the resource; however, given the proposed utilization standards and the timing of grazing, any benefit from such an effect may not be measurable.

Because Alternatives 1, 2, and 3 would have little or no impact on soils, there would be no cumulative impact caused by the incremental addition of the effects of any of the alternatives to the effects of other past, present, or reasonably foreseeable activities in the project area.

Contact Information

If you have any questions please contact me at 541-278-3817.

/s/ Jim Archuleta

Forest Soil Scientist Umatilla National Forest

Appendix A

Project Design Criteria

Soil protection and erosion control criteria is as follows:

- Adequate Effective Ground Cover (EGC) will be maintained around all spring developments to minimize potential compaction and erosion potentials.
- Time allotment grazing for the greatest amount of vegetation as EGC to limit soil productivity losses in the allotment.
- Develop water sources to minimize compaction in areas of shallow soils.

Table 1 TEUI information related to proposed springs in Tamarack Allotment EA

Soil Series	Soil Order	Moisture Regime	Moisture Benefiting or Limiting Condition	FID Number Spring Devel. (Allotment Pasture)	Spring Location (Lat, Long)
Limberjim	Andisol	Udic	Deep well drained ash soil	1 (Wildhorse	44.882657, -119.612729
				2 (Wildhorse)	44.883294, -119.605037
				3 (Wildhorse)	44.885506, -119.601095
				4 (Wildhorse)	44.886252, -119.598752
				5 (Wildhorse)	44.886501, -119.594101
Anatone	Mollisol	Xeric	Shallow depth, Loamy-skeletal	7 (Wildhorse)	44.625, -119.617
Bocker	Mollisol	Xeric	Shallow depth, Loamy-skeletal	8 (Wildhorse)	No data in record

Soil Series	**Soil Order**	**Moisture Regime**	**Moisture Benefiting or Limiting Condition**	**FID Number Spring Devel. (Allotment Pasture)**	**Spring Location (Lat, Long)**
Bolony	Mollisol	Xeric	Mod deep, well drained ash soil	7 (Wildhorse)	44.625, -119.617
Fivebeaver	Mollisol	Xeric	Shallow depth, Loamy-skeletal	6 (Wildhorse)	44.885851, -119.627007
Fivebit	Mollisol	Xeric	Shallow depth, Loamy-skeletal	8 (Wildhorse)	No data in GIS record
Klicker	Mollisol	Xeric	Mod deep, well drained ash soil	7 (Wildhorse)	44.625, -119.617
Klickson	Mollisol	Xeric	Deep to V. Deep well drained ash soil	0 (Little Tamarack)	44.872703, -119.645017
Larabee	Mollisol	Xeric	Mod deep, well drained ash soil	6 (Wildhorse)	44.885851, -119.627007
Melhorn	Mollisol	Xeric	V. Deep well drained ash soil	0 (Little Tamarack)	44.872703, -119.645017
Olot	Andisol	Xeric	Mod deep, well drained ash soil	0 (Little Tamarack)	44.872703, -119.645017
				1 (Wildhorse)	44.882657, -119.612729
				2 (Wildhorse)	44.883294, -119.605037

SOILS					
Soil Series	**Soil Order**	**Moisture Regime**	**Moisture Benefiting or Limiting Condition**	**FID Number Spring Devel. (Allotment Pasture)**	**Spring Location (Lat, Long)**
				3 (Wildhorse)	44.885506, -119.601095
				4 (Wildhorse)	44.886252, -119.598752
				5 (Wildhorse)	44.886501, -119.594101
Parsnip	Mollisol	Xeric	Shallow, well drained	8 (Wildhorse)	No location data in record
Tolo	Andisol	Xeric	Deep to V. Deep well drained ash soil	1 (Wildhorse)	44.882657, -119.612729
				2 (Wildhorse)	44.883294, -119.605037
				3 (Wildhorse)	44.885506, -119.601095
				4 (Wildhorse)	44.886252, -119.598752
				5 (Wildhorse)	44.886501, -119.594101
				6 (Wildhorse)	44.885851, -119.627007

Reference

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